GEOLOGICAL AND GEOGRAPHICAL
ATLAS OF COLORADO
AND
PORTIONS OF ADJACENT TERRITORY

HAYDEN

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DEPARTMENT OF THE INTERIOR.
UNITED STATES GEOLOGICAL AND GEOGRAPHICAL SURVEYS
OF THE TERRITORIES.

GEOLOGICAL AND GEOGRAPHICAL
ATLAS
OF
COLORADO
AND PORTIONS OF ADJACENT TERRITORY

BY

F. V. HAYDEN

U. S. GEOLOGIST IN CHARGE

1877.

JULIUS BIEN, LITH.

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LIST OF SHEETS.

I. TRIANGULATION MAP.
II. DRAINAGE MAP.
III. ECONOMIC MAP.
IV. GENERAL GEOLOGICAL MAP.

TOPOGRAPHICAL.	GEOLOGICAL.
V. NORTHWESTERN COLORADO.	XI. NORTHWESTERN COLORADO.
VI. NORTHERN CENTRAL COLORADO.	XII. NORTHERN CENTRAL COLORADO.
VII. CENTRAL COLORADO.	XIII. CENTRAL COLORADO.
VIII. WESTERN COLORADO.	XIV. WESTERN COLORADO.
IX. SOUTHWESTERN COLORADO.	XV. SOUTHWESTERN COLORADO.
X. SOUTHERN CENTRAL COLORADO.	XVI. SOUTHERN CENTRAL COLORADO.

XVII. & XVIII. GEOLOGICAL SECTIONS.
XIX. & XX. PANORAMIC VIEWS.

LEGEND.

This Atlas is composed of two series of maps: the first, of four sheets, on a scale of twelve miles to one inch, each covering the whole State of Colorado; the second, of twelve sheets, (six topographical and six geological, of identical areas,) on a scale of four miles to one inch, each sheet embracing two and one-half degrees of Longitude and one and one-quarter degrees of Latitude, the whole presenting the results of the field work of 1873, '74, '75 and '76, covering the entire State of Colorado and adjacent portions of Utah, Arizona and New Mexico.

The position of these sheets is indicated on the general geological map.

The projection of the second series is that of a secant cone, and is so constructed that they may be joined together as one map.

Contours represent, approximately, two hundred feet vertical interval.

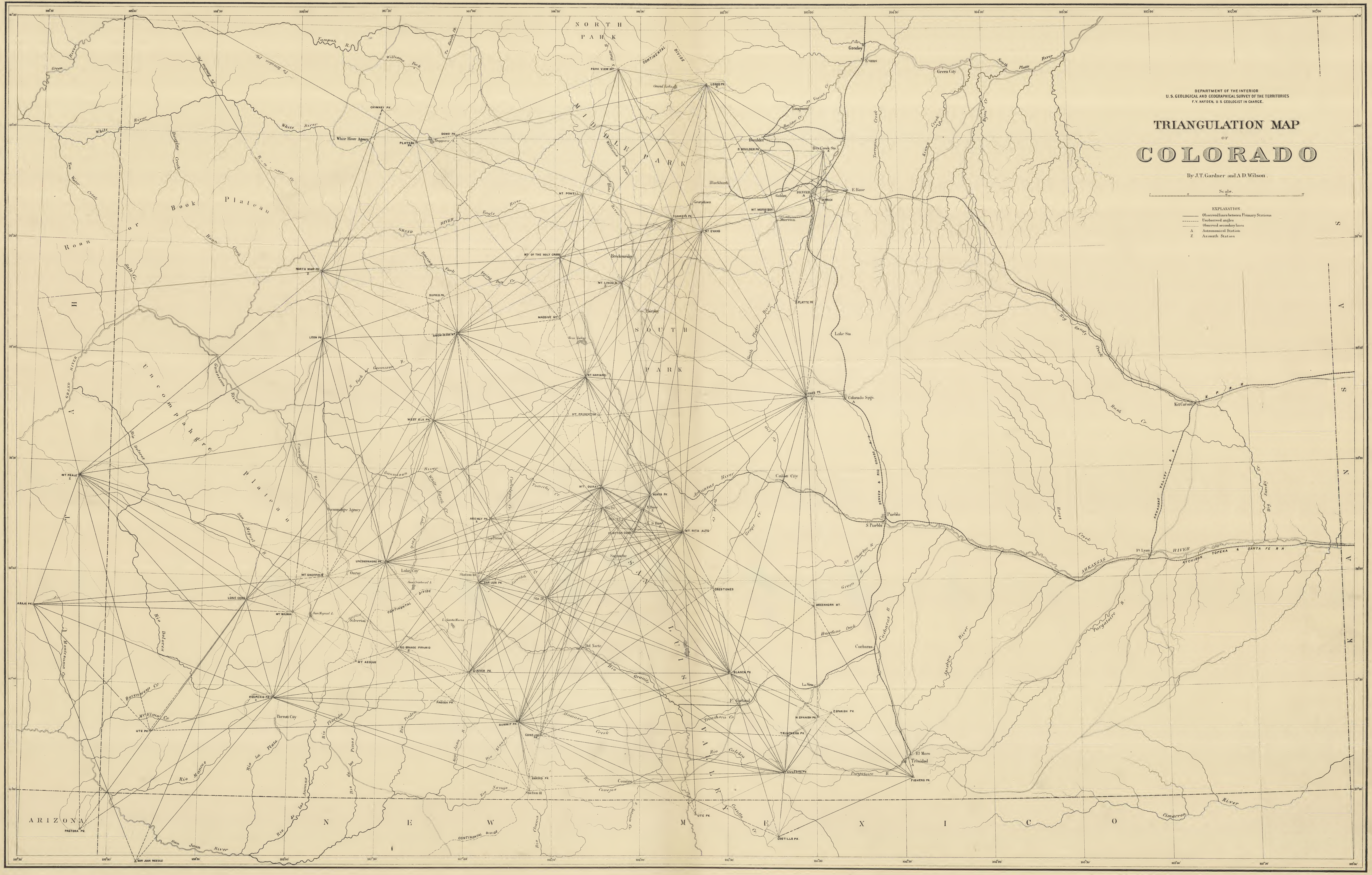
A statement of the method of geographical work, together with the mathematical basis, will be found in the Annual Report for 1876.

The work of Primary Triangulation was carried on by J. T. Gardner, from 1873 to the Autumn of 1875, and was completed by A. D. Wilson.

The preparation of the colored sheets and the general supervision of their publication was entrusted to W. H. Holmes.

F. V. HAYDEN,
U. S. Geologist-in-charge.

SHEET I



DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES
F. V. HAYDEN, U. S. GEOLOGIST IN CHARGE.

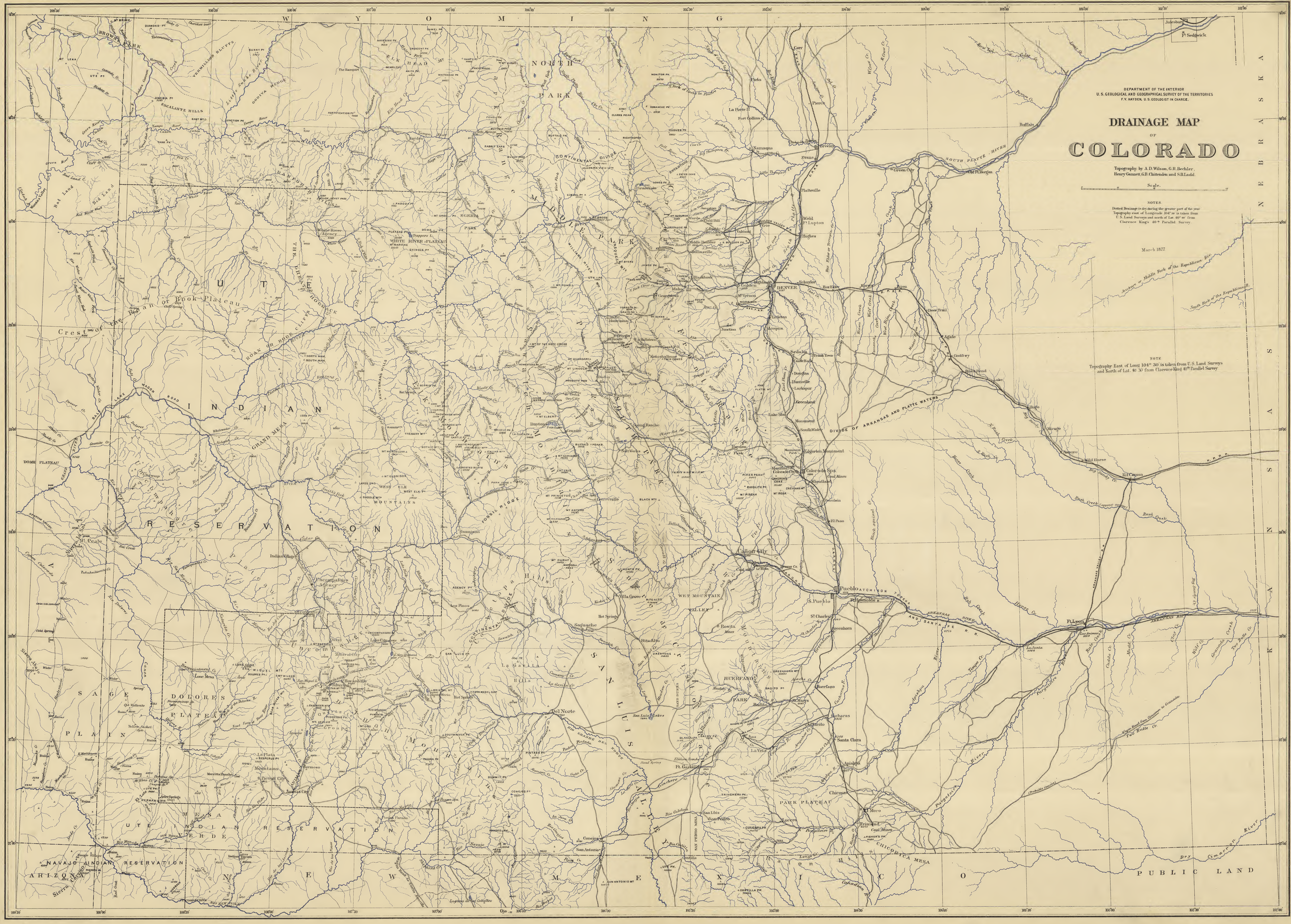
TRIANGULATION MAP
OF
COLORADO

By J. T. Gardner and A. D. Wilson.

Scale.

EXPLANATION.

- Observed lines between Primary Stations
- Unobserved angles
- Observed secondary lines
- A. Astronomical Station
- Z. Azimuth Station



DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES
F.V. HAYDEN, U.S. GEOLOGIST IN CHARGE.

DRAINAGE MAP
OF
COLORADO

Topography by A.D.Wilson, G.R.Bechler,
Henry Gannett, G.B.Chittenden and S.B.Ladd.

Scale.

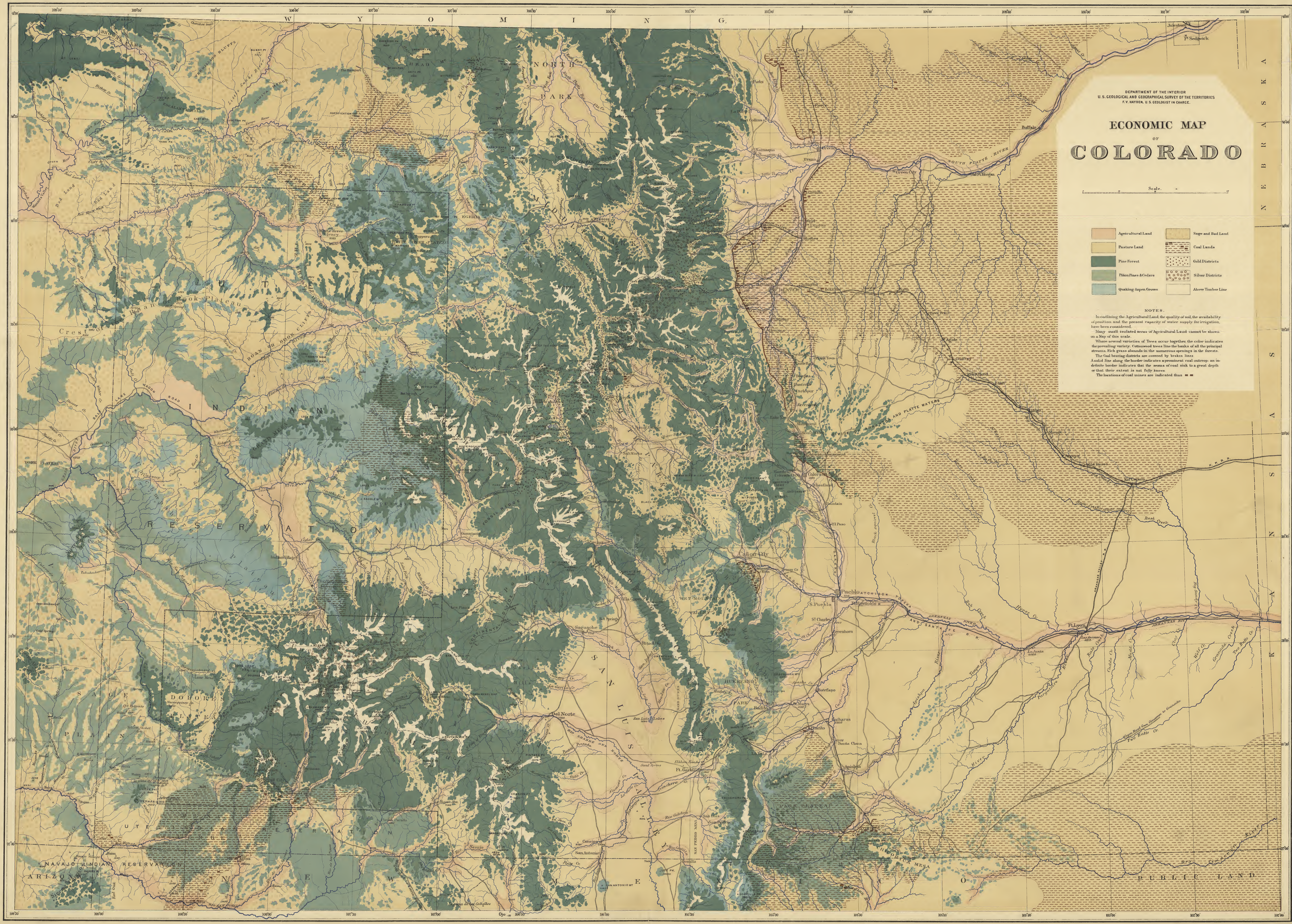
NOTES.

Dotted Drainage is dry during the greater part of the year.
Topography east of Longitude 104° 30′ is taken from
U.S. Land Surveys and north of Lat. 40° 30′ from
Clarence King's 40th Parallel Survey.

March 1877.

NOTE

Topography East of Long 104° 30′ is taken from U.S. Land Surveys
and North of Lat. 40 30 from Clarence King 40th Parallel Survey



DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES
F. V. HAYDEN, U. S. GEOLOGIST IN CHARGE.

ECONOMIC MAP
OF
COLORADO

NOTES.

In outlining the Agricultural Land, the quality of soil, the availability of position and the present capacity of water supply for irrigation, have been considered.

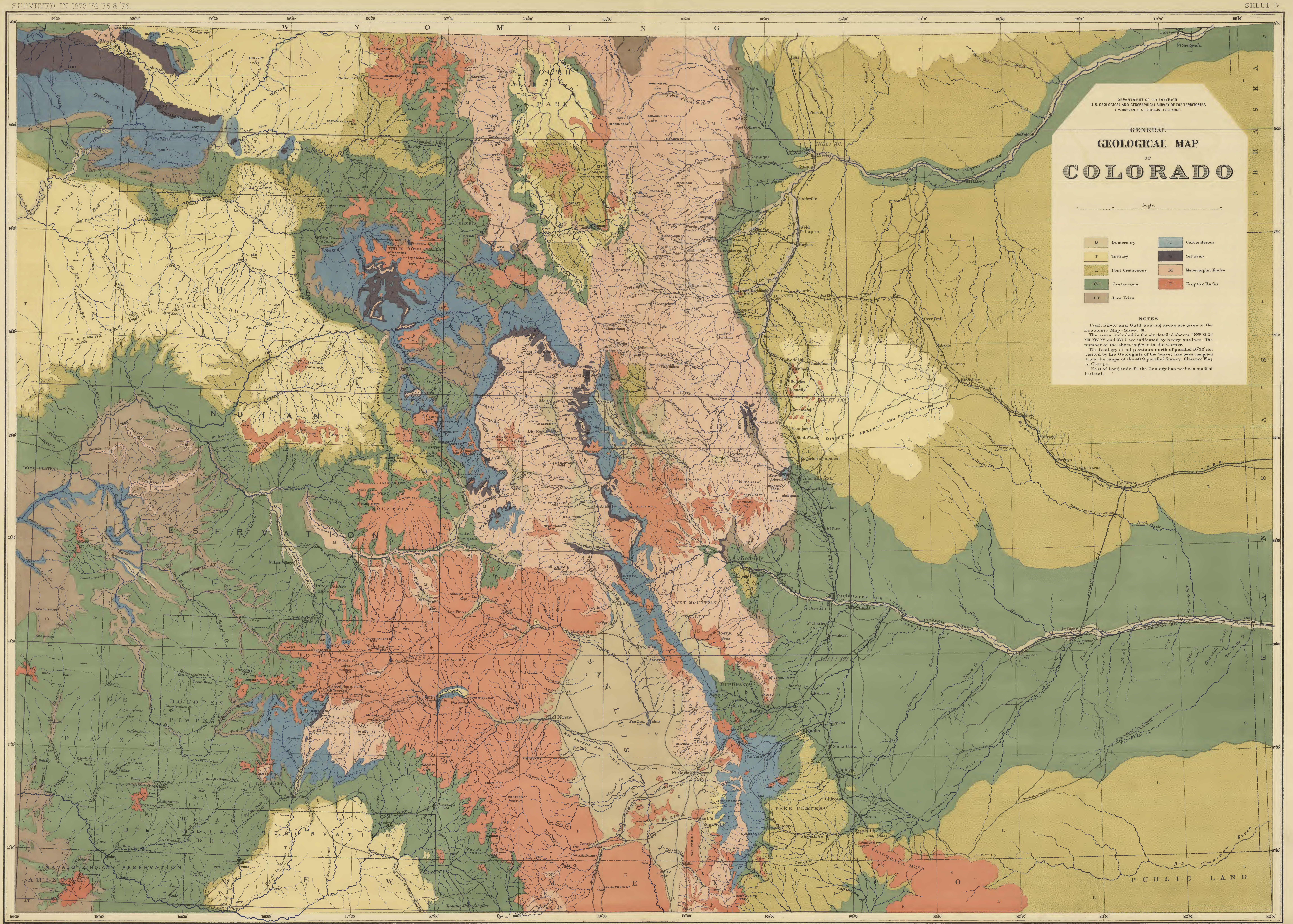
Many small isolated areas of Agricultural Land cannot be shown on a Map of this scale.

Where several varieties of Trees occur together, the color indicates the prevailing variety. Cottonwood trees line the banks of all the principal streams. Rich grass abounds in the numerous openings in the forests.

The Coal bearing districts are covered by broken lines A solid line along the border indicates a prominent coal outcrop: an indefinite border indicates that the seams of coal sink to a great depth or that their extent is not fully known.

The locations of coal mines are indicated thus ▬ ▬

SURVEYED IN 1873 '74 '75 & '76. SHEET IV.



DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES
F. V. HAYDEN, U. S. GEOLOGIST IN CHARGE.

GENERAL GEOLOGICAL MAP OF COLORADO

Scale.

0 12 24 48

Q	Quaternary
T	Tertiary
L	Post Cretaceous
Cr	Cretaceous
J. T.	Jura-Trias
C	Carboniferous
S	Silurian
M	Metamorphic Rocks
E	Eruptive Rocks

NOTES

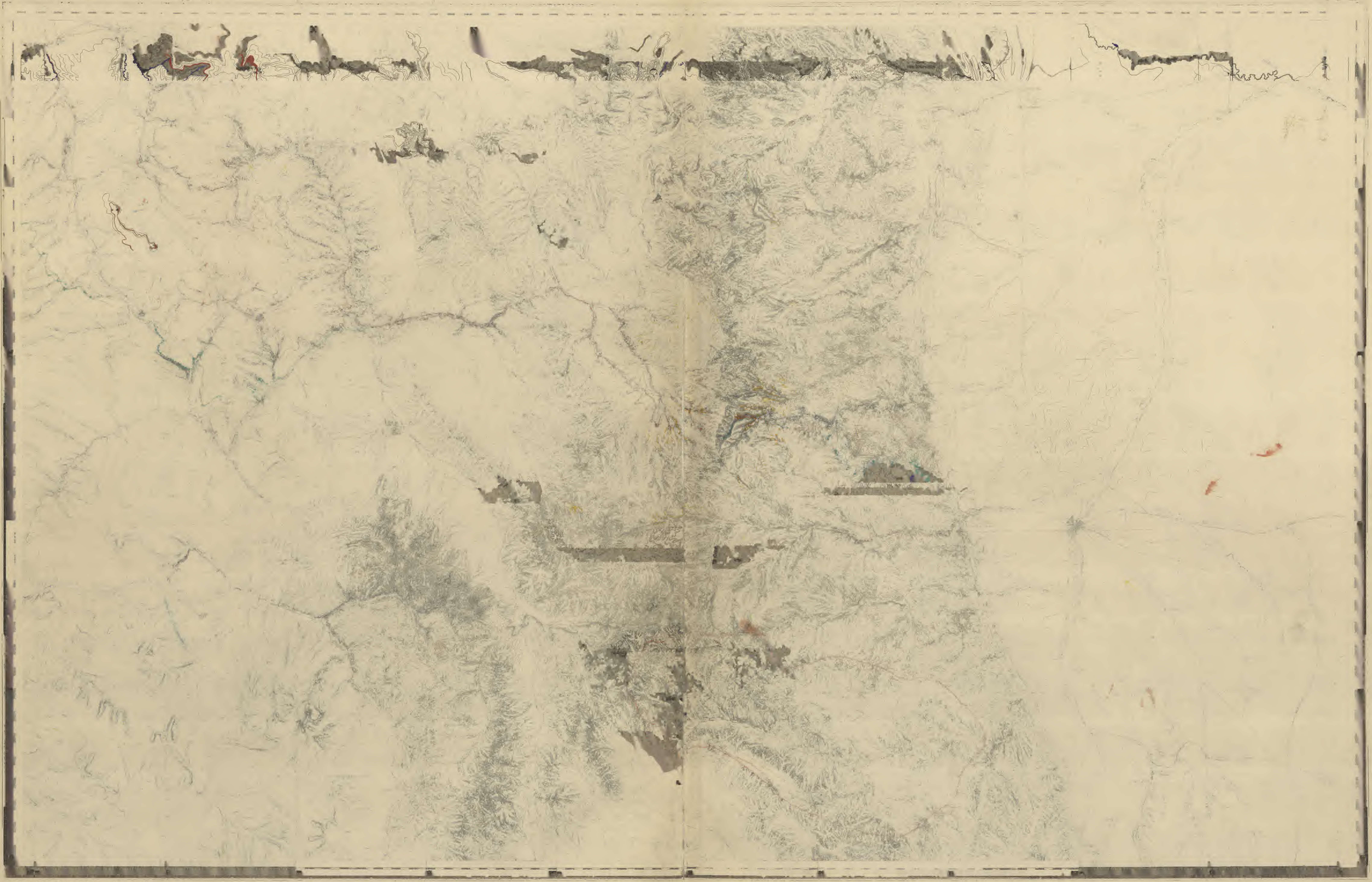
Coal, Silver and Gold bearing areas are given on the Economic Map - Sheet III.

The areas included in the six detailed sheets (Nos XI. XII. XIII. XIV. XV and XVI.) are indicated by heavy outlines. The number of the sheet is given in the Corner.

The Geology of all portions north of parallel 40°30', not visited by the Geologists of the Survey, has been compiled from the maps of the 40th parallel Survey, Clarence King in Charge.

East of Longitude 104 the Geology has not been studied in detail.

E
V

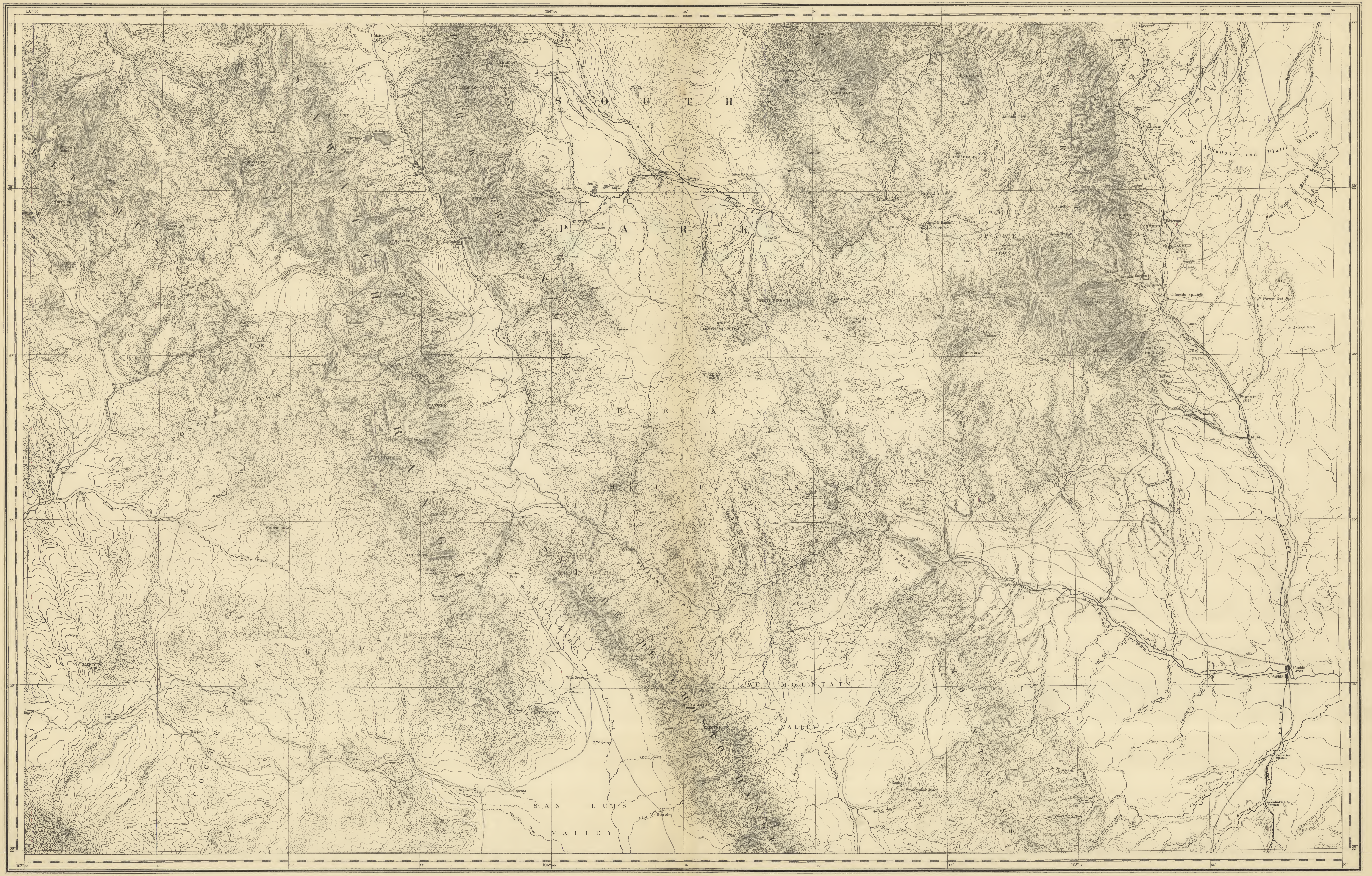


U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, F.V. HAYDEN IN CHARGE.

CENTRAL COLORADO.

SURVEYED IN 1874 & 75

SHEET VII



A. D. Wilson, G. R. Bechler, H. Gannett and G. B. Chittenden, Topographical Assistants.

Meters.

5000 0 5000 10000 20000 30000 40000

Statute Miles.

4 3 2 1 0 4 8 12 16 20 24

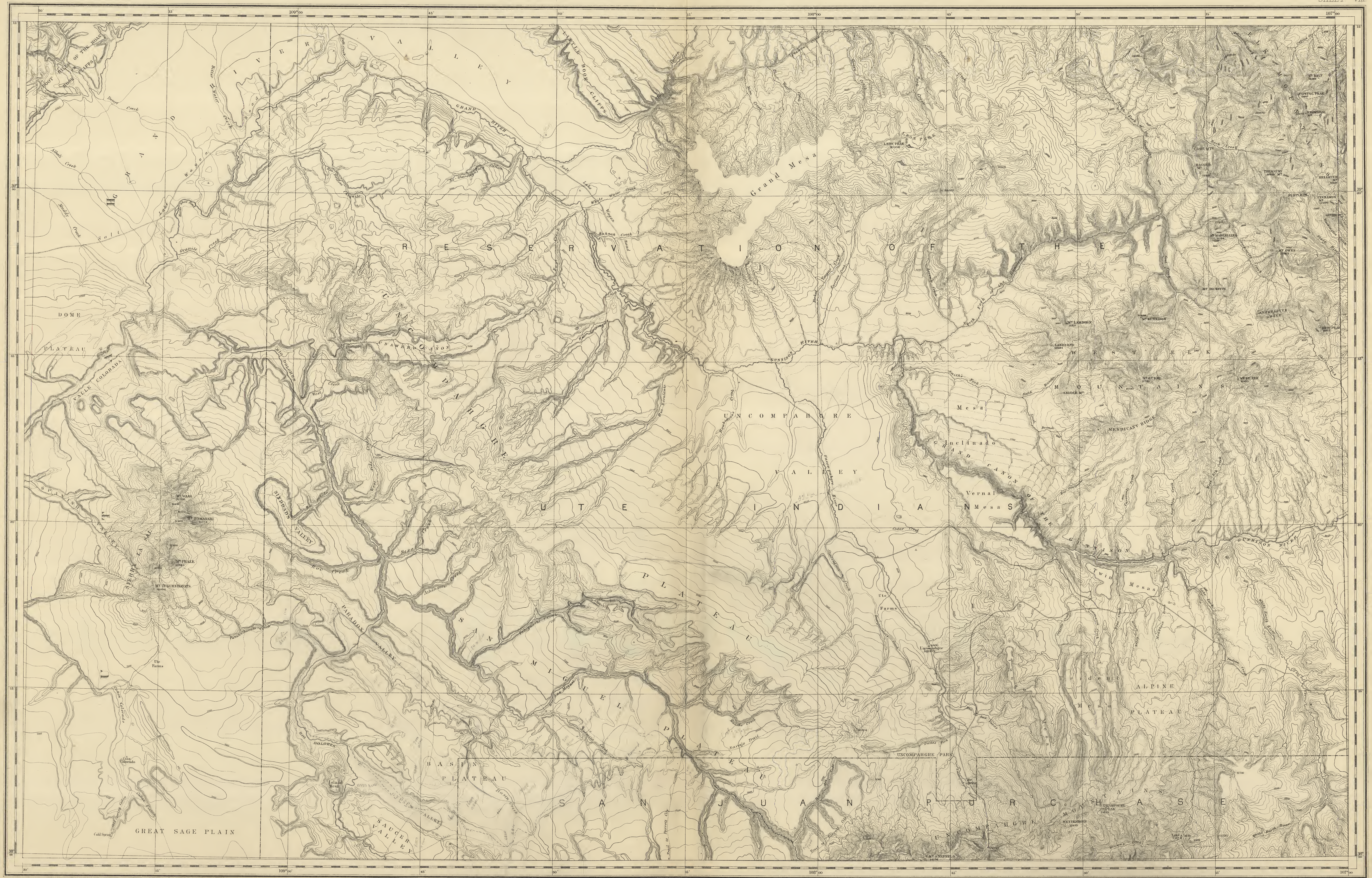
Scale 4 miles to 1 inch or 1: 253440.
Contours 200 feet Vertical Interval.

U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, F.V. HAYDEN IN CHARGE.

SURVEYED IN 1874-'75 & '76

WESTERN COLORADO AND PART OF UTAH.

SHEET VIII.



Henry Gannett and A.D. Wilson, Topographical Assistants.

Meters.
5000 0 5000 10000 20000 30000 40000

Statute Miles.
4 3 2 1 0 4 8 12 16 20 24

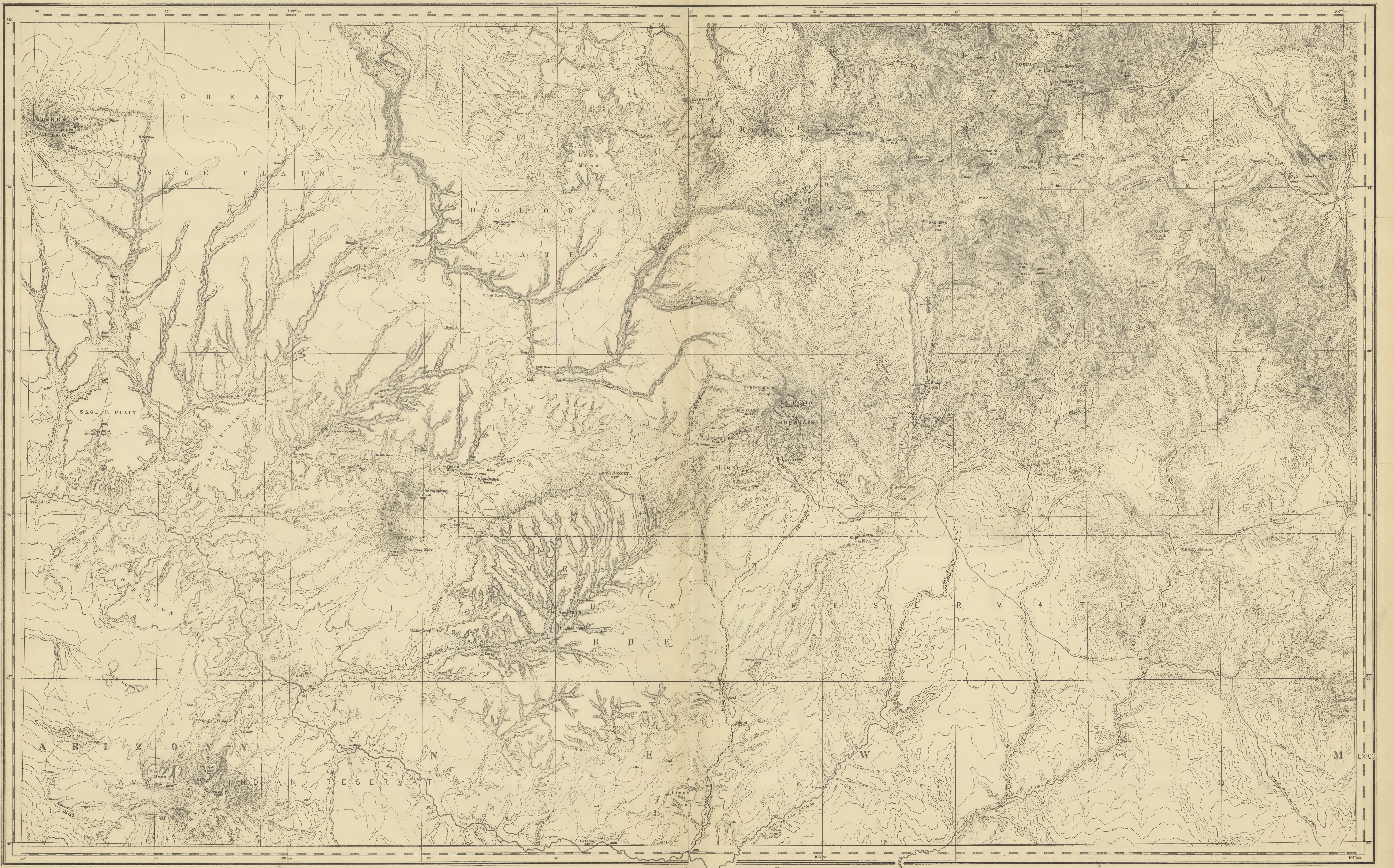
Scale 4 miles to 1 inch or 1: 253440
Contours 200 feet Vertical Interval.

U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, F.V. HAYDEN IN CHARGE.

S.W. COLORADO AND PARTS OF NEW MEXICO, ARIZONA AND UTAH.

SURVEYED IN 1874 & '75.

SHEET IX



G.B. Chittenden and A.D. Wilson Topographical Assistants

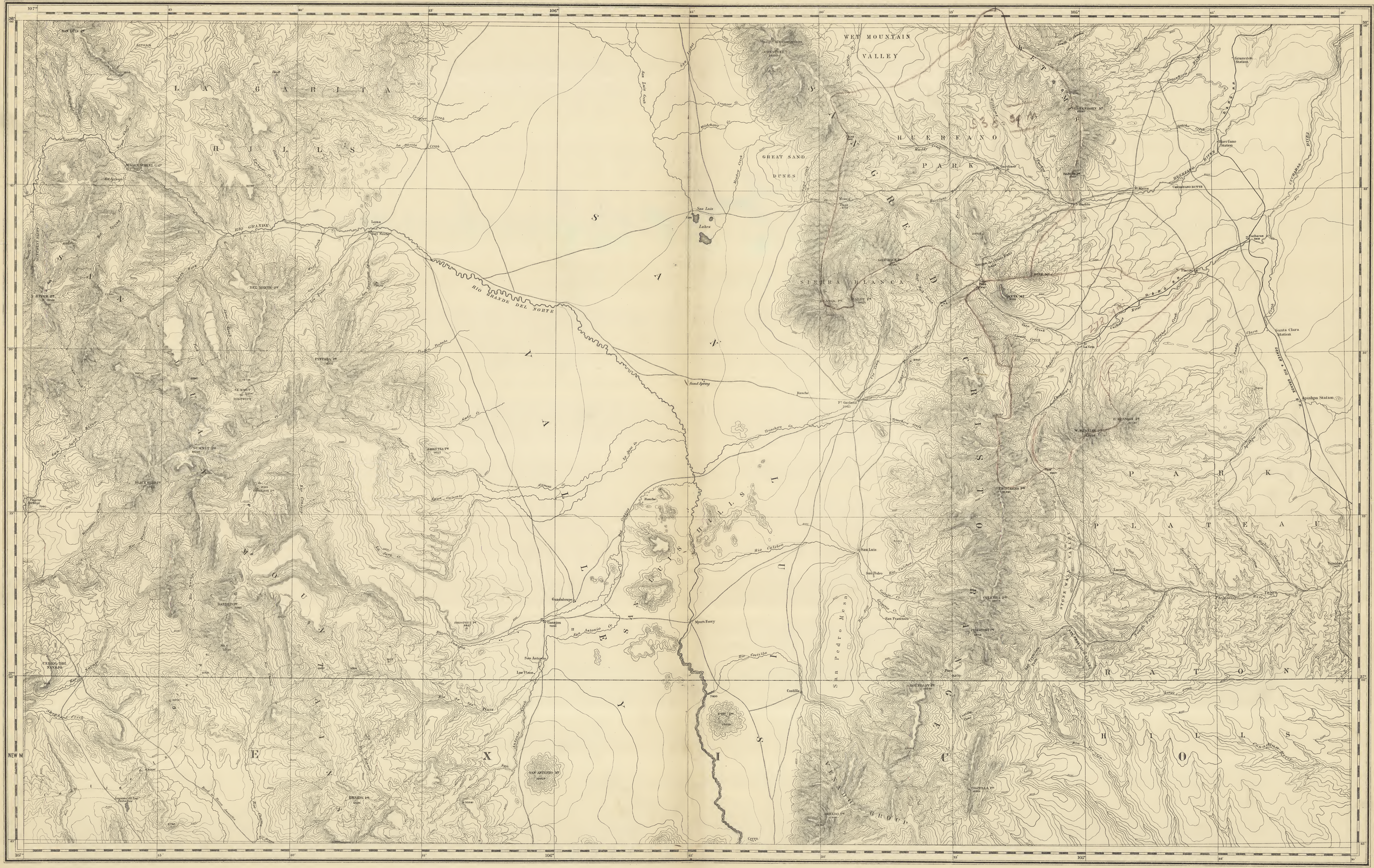
Scale 4 miles to 1 inch or 1: 253440.
Contours 200 feet Vertical Interval.

U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, F.V. HAYDEN IN CHARGE.

SOUTHERN CENTRAL COLORADO AND PART OF NEW MEXICO.

SURVEYED IN 1874 & 75

SHEET X



A. D. Wilson, Topographical Assistant.

Meters

Statute Miles

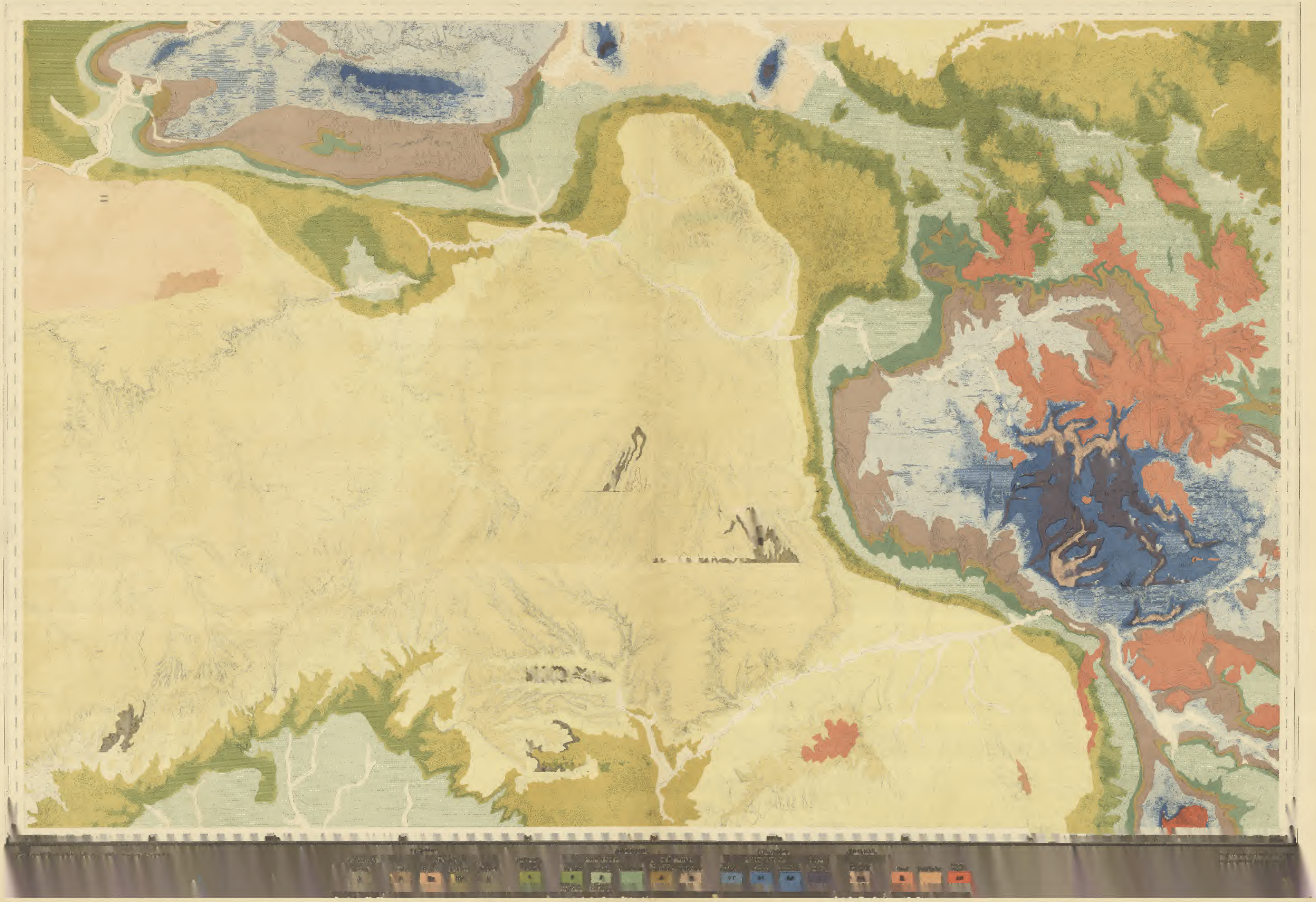
Scale 4 miles to 1 inch or 1: 253440.
Contours 200 feet Vertical Interval.

77.60
44.12
33.48

11.25
77.60
33.65

33.60
16
2016
336
537.6

17.40
16
10440
1740
278.40

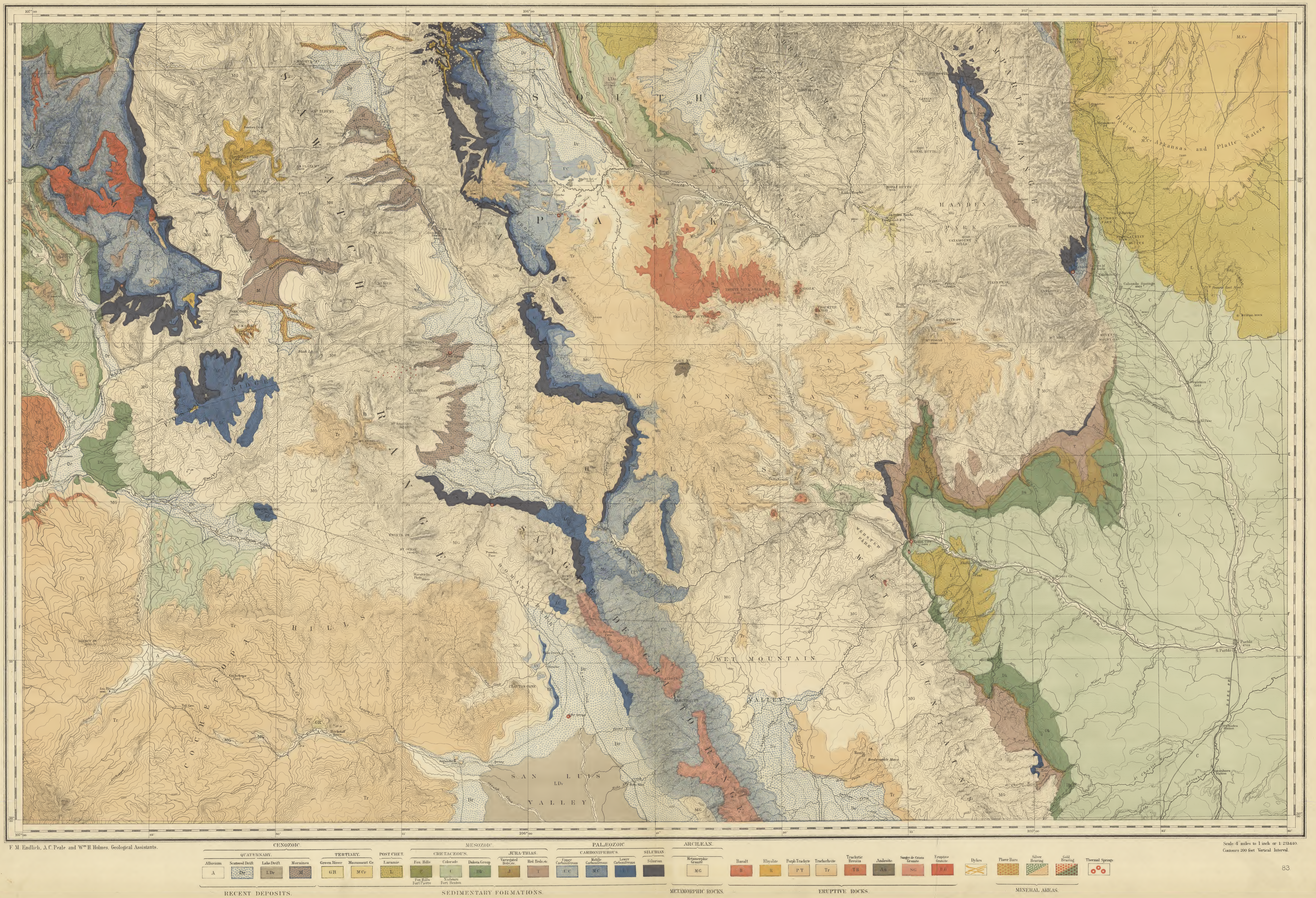


SURVEYED IN 1873, 74 & 75

U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, F. V. HAYDEN IN CHARGE.

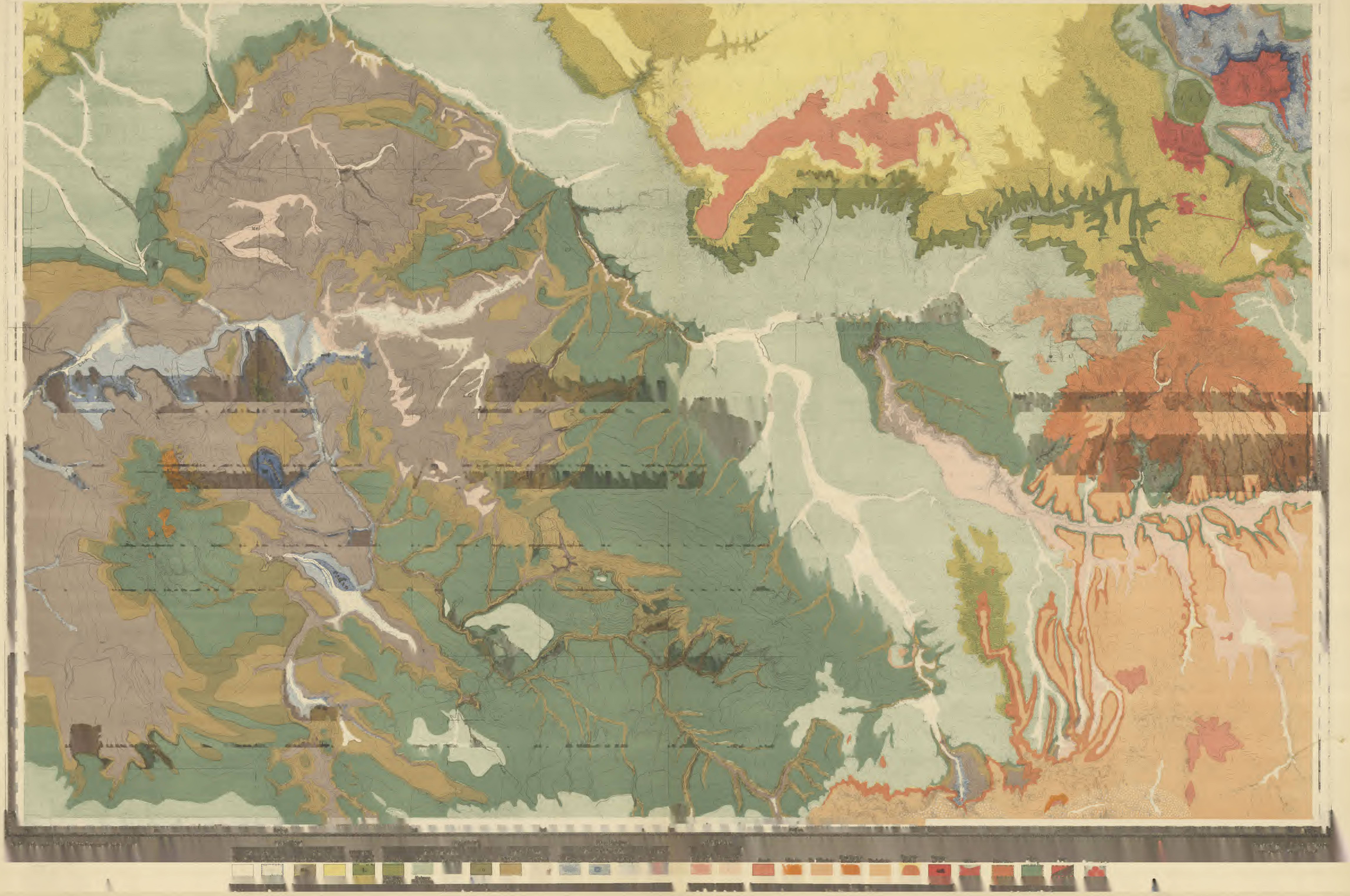
CENTRAL COLORADO.

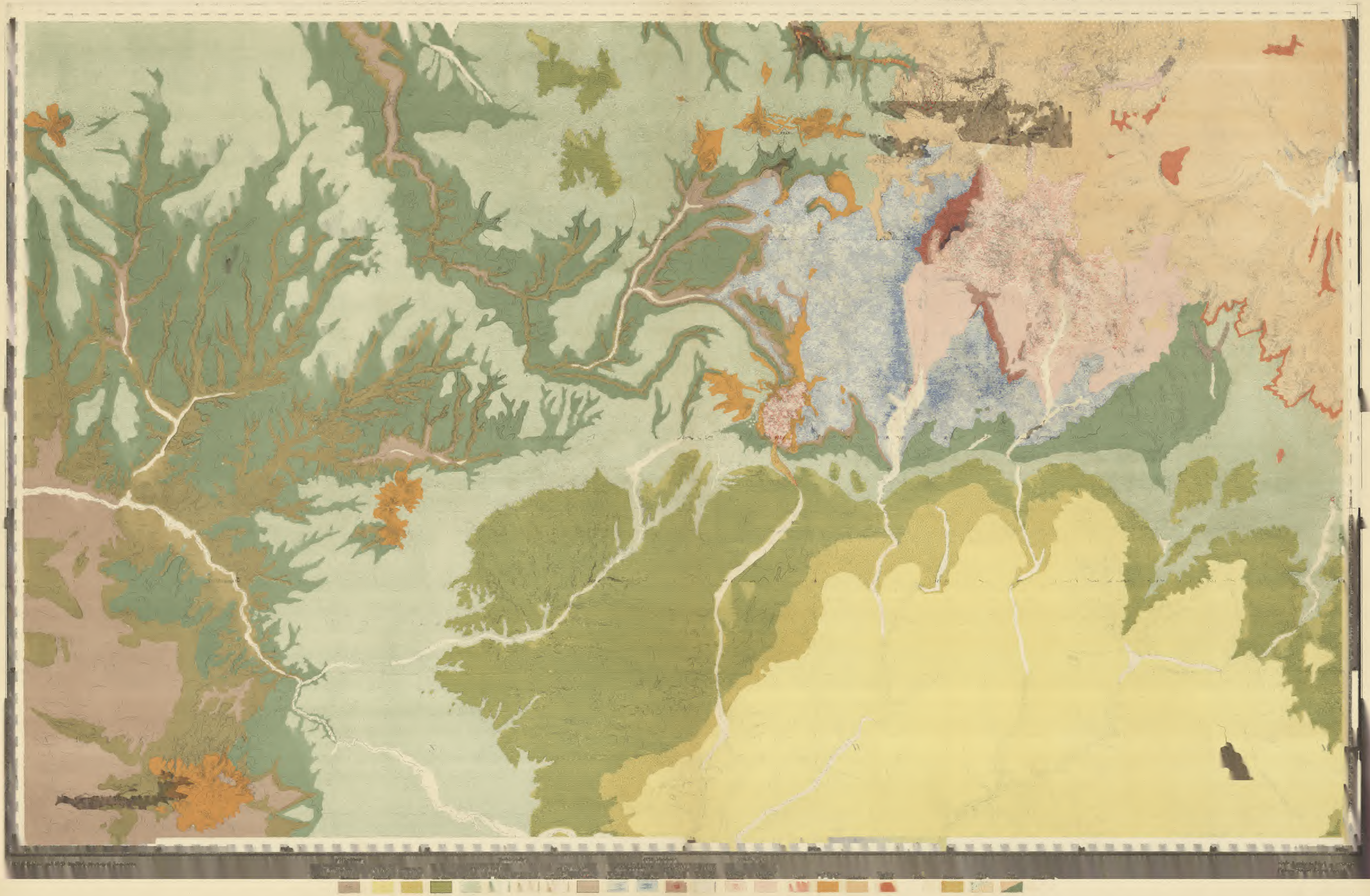
SURVEYED IN 1873, '74 & '75. SHEET XIII



F. M. Endlich, A. C. Peale and Wm. H. Holmes, Geological Assistants.

Scale 4 miles to 1 inch or 1: 253440.
Contours 200 feet Vertical Interval.





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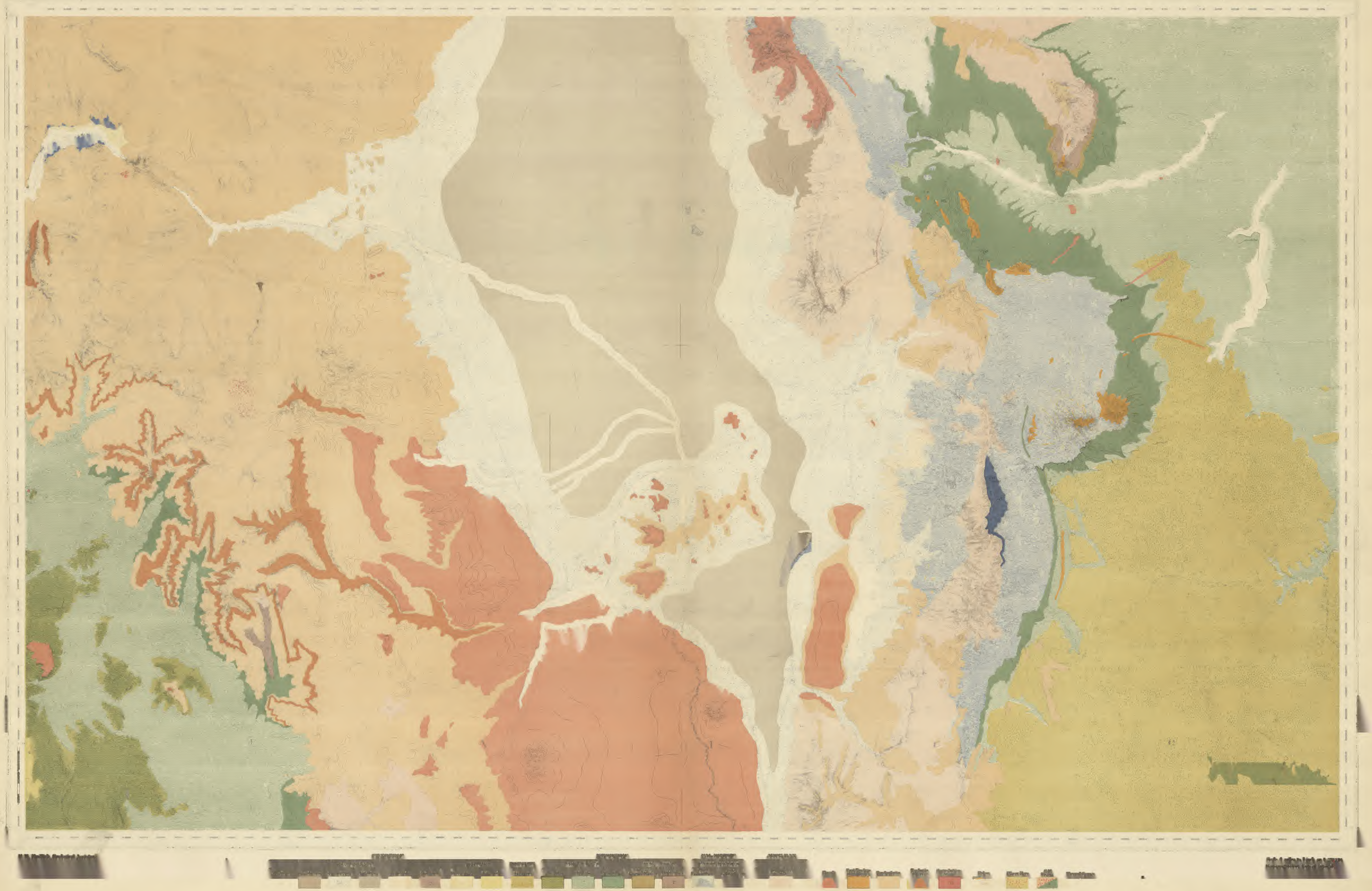


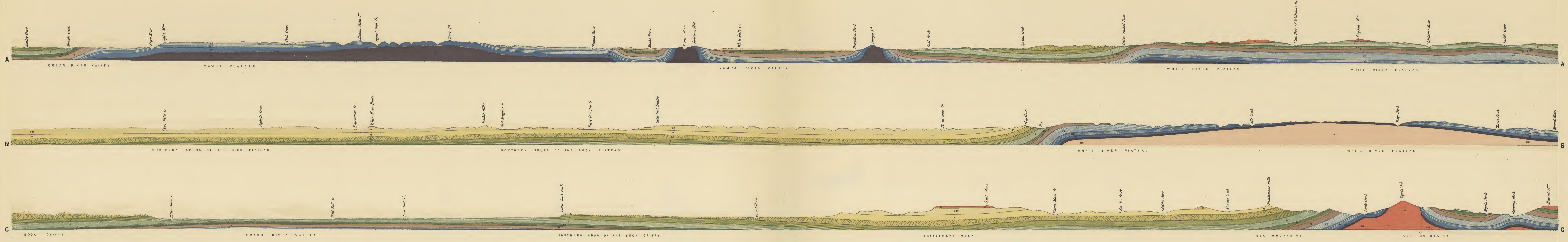
WESTERN HALF

SHEET XVII.

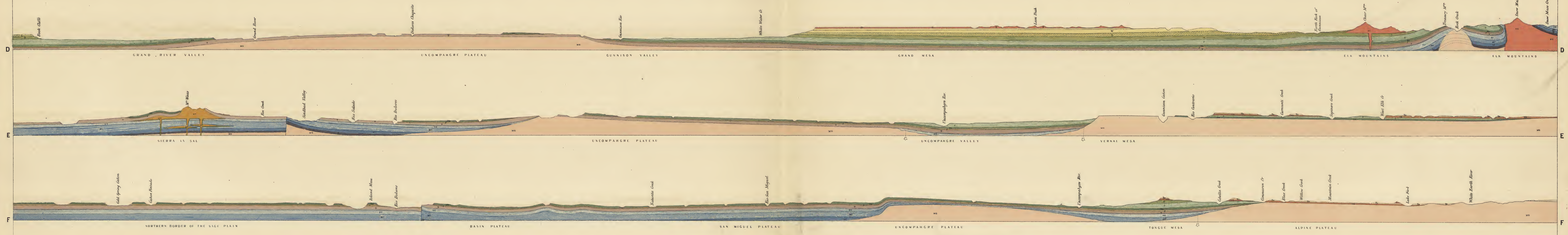
U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, F. V. HAYDEN IN CHARGE.

GEOLOGICAL SECTIONS.

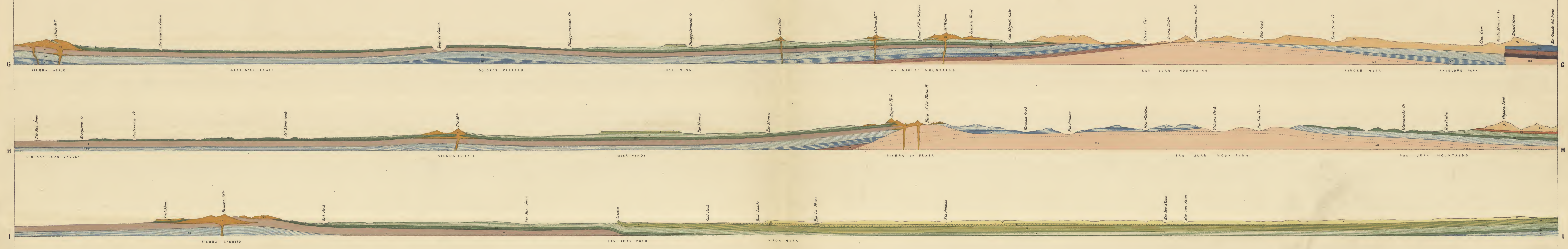
SECTIONS TO ACCOMPANY SHEET XI.



SECTIONS TO ACCOMPANY SHEET XIV.



SECTIONS TO ACCOMPANY SHEET XV.



☆ Terminations of Sedimentary Formations are obscure, but their character indicates the existence of an ancient shore line.

Dotted lines in the M G show the probable continuation of metamorphosed strata
Some of the thinner formations are slightly exaggerated in thickness

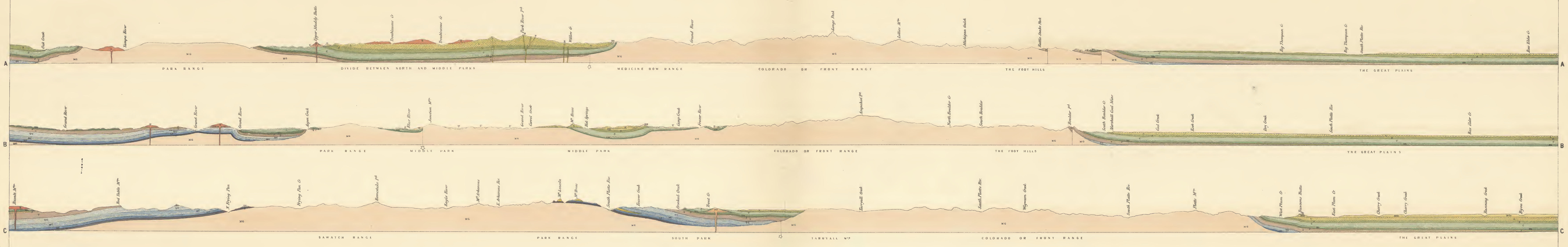
These Sections are continued eastward on sheet XVIII.
Vertical scale 20000 feet to one inch.
Horizontal scale 21170 feet to one inch.
Base line of sections represents sea level.

RECENT DEPOSITS.	CENOZOIC.	TERTIARY.	Uinta	U Lake Beds
RECENT DEPOSITS.	CENOZOIC.	TERTIARY.	Green River	GR
RECENT DEPOSITS.	CENOZOIC.	TERTIARY.	Wahsatch	W
SEDIMENTARY FORMATIONS.	MESOZOIC.	POST CRET.	Laramie	L
SEDIMENTARY FORMATIONS.	MESOZOIC.	CRETACEOUS.	Fox Hills	F Fox Hills Fort Pierre
SEDIMENTARY FORMATIONS.	MESOZOIC.	CRETACEOUS.	Colorado	C Niobrara Fort Benton
SEDIMENTARY FORMATIONS.	MESOZOIC.	CRETACEOUS.	Dakota Group	Dk
SEDIMENTARY FORMATIONS.	MESOZOIC.	JURA-TRIAS.	Jurassic? Variegated Beds etc.	J
SEDIMENTARY FORMATIONS.	MESOZOIC.	JURA-TRIAS.	Triassic? Red Beds etc.	T
SEDIMENTARY FORMATIONS.	PALÆOZOIC.	CARBONIFEROUS.	Upper Carboniferous	U C
SEDIMENTARY FORMATIONS.	PALÆOZOIC.	CARBONIFEROUS.	Middle Carboniferous	M C
SEDIMENTARY FORMATIONS.	PALÆOZOIC.	CARBONIFEROUS.	Lower Carboniferous	L C
SEDIMENTARY FORMATIONS.	PALÆOZOIC.	DEVONIAN.	Devonian	D
SEDIMENTARY FORMATIONS.	PALÆOZOIC.	SILURIAN.	Silurian	S
METAMORPHIC ROCKS.	ARCHÆAN.		Metamorphic Granite	M G
ERUPTIVE ROCKS.			Basalt	B
ERUPTIVE ROCKS.			Porph Trachyte (Hornblendic)	H T
ERUPTIVE ROCKS.			Trachorheite	Tr
ERUPTIVE ROCKS.			Trachytic Breccia	T B
ERUPTIVE ROCKS.			Eruptive Granite	E G

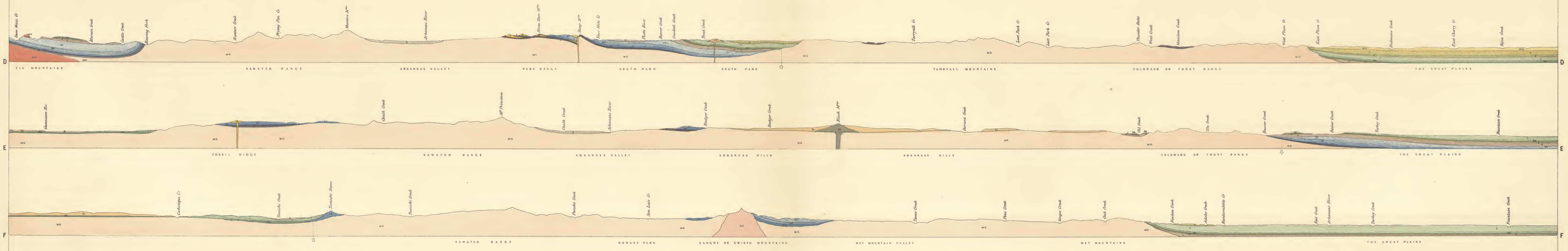
U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, F. V. HAYDEN IN CHARGE.

GEOLOGICAL SECTIONS.

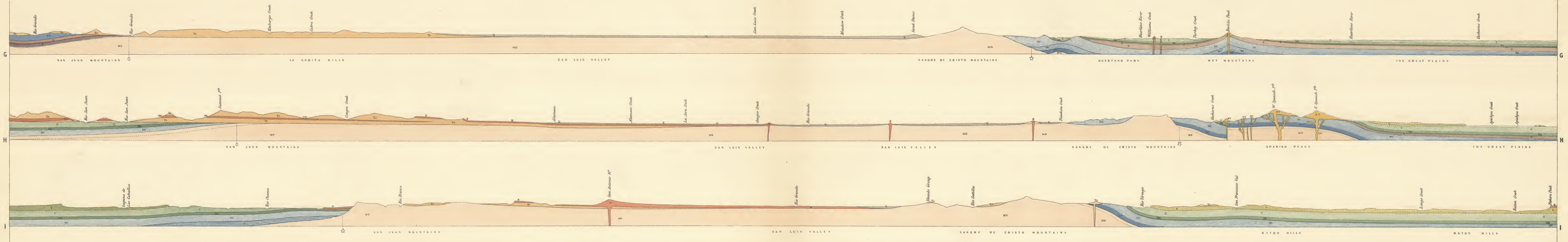
SECTIONS TO ACCOMPANY SHEET XII.



SECTIONS TO ACCOMPANY SHEET XIII.



SECTIONS TO ACCOMPANY SHEET XVI.



☆ Terminations of Sedimentary Formations are obscure, but their character indicates the existence of an ancient shore line.

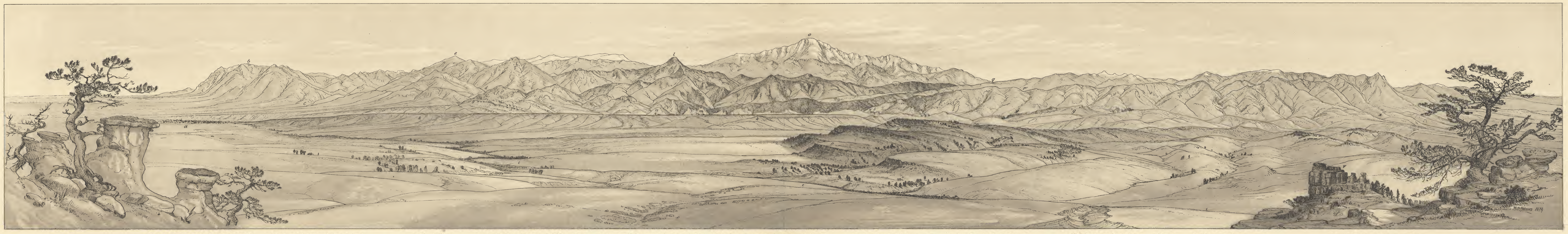
Dotted lines in the M.G. show the probable continuation of metamorphosed strata.
Some of the thinner formations are slightly exaggerated in thickness.

These Sections are continued westward on sheet XVII.
Vertical scale 20000 feet to one inch.
Horizontal scale 21170 feet to one inch.
Base line of sections represents sea level.

CENOZOIC.				MESOZOIC.					PALÆOZOIC.					ARCHÆAN.										
TERTIARY.			POST CRET.	CRETACEOUS.			JURA-TRIAS.		CARBONIFEROUS.			DEVONIAN.	SILURIAN.											
Quaternary	Uinta	Monument Cr.	Laramie	Fox Hills	Colorado	Dakota Group	Jurassic? Variegated Beds etc	Triassic? Red Beds etc	Upper Carboniferous	Middle Carboniferous	Lower Carboniferous	Devonian	Silurian	Metamorphic Granite	Basalt	Doleritic Breccia	Rhyolite	Porph. Trachyte	Porph. Trachyte (Hornblendic)	Trachorheite	Trachytic Breccia	Andesite	Sangre de Cristo Granite	Eruptive Granite
Q	U	M Cr.	L	F	C	Dk	J	T	U C	M C	L C	D	S	MG	B	D B	R	P T	H T	Tr.	T B	An.	S G	E G
	Lake Beds			Fox Hills Fort Pierre	Niobrara Fort Benton																			
SEDIMENTARY FORMATIONS.														METAMORPHIC ROCKS.	ERUPTIVE ROCKS.									

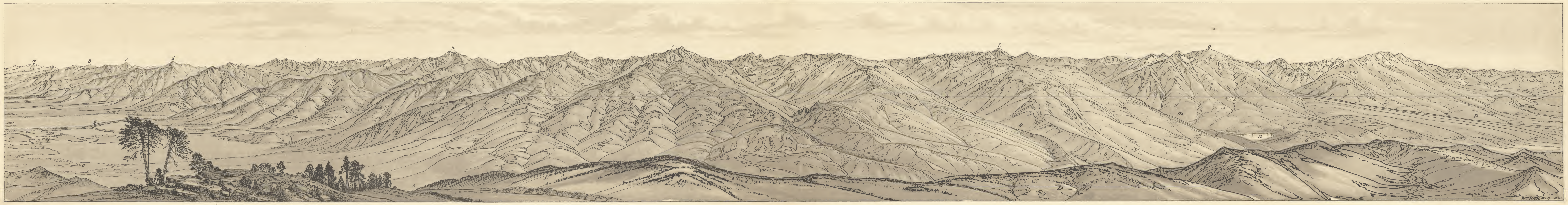
U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES. F.V. HAYDEN IN CHARGE.

PANORAMIC VIEWS.



a, Colorado Springs 5984 ft. *b*, Cheyenne Mt 9948 ft *c*, Cheyenne Cañon *d*, Bear Creek *e*, Monte Rosa *j*, Red Sandstones *k, k*, Mésa, (Cretaceous Nos 4, and 5.) *l*, Camerons Cone 11460 ft *m*, Garden of the Gods *n*, Location of Manitou *o*, Pikes Pk 14147 ft *p, p*, Austin's Bluffs (coal series) *q*, Ute Pass *r*, Queen's Cañon *s*, Glen Eyrie *g*, Lower Cretaceous Rocks *t, t*, Monument Cr. *v*, Castle Rocks *x*, Monument Park

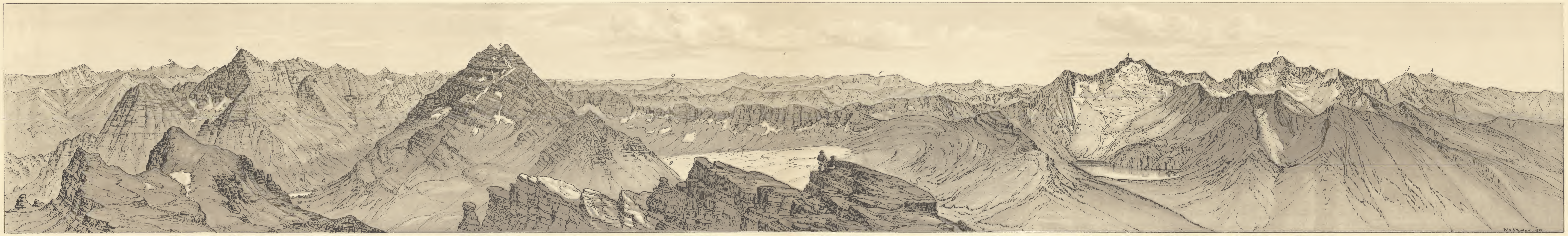
THE PIKE'S PEAK GROUP
FROM BLUFF EAST OF MONUMENT CREEK



a, Mt. Ouray 14043 ft *b*, Mt. Shavano 14239 ft *c*, Mt. Antero 14245 ft *d*, Mt. Princeton 14200 ft. *e, e*, Arkansas Valley *f*, Chalk Cr. *g*, Cottonwood Cr. *h*, Mt. Yale 14187 ft. *i*, Mt. Harvard 14375 ft *j, j*, Pine Cr. *k, k*, Clear Cr. *l*, La Plata Mt. 14311 ft *m*, Lake Cr. *n*, Twin Lakes 9357 ft *o*, Mt. Elbert 14351 ft *p, p*, Elbert Cr. *r*, Massive Mt. 14298 ft *s, s, s, s*, Moraines

Mountains entirely granitic. Morainal deposit and local Drift cover most of the lower slopes and Valleys.

VIEW OF THE SAWATCH RANGE
FROM BUFFALO PEAK.



a, Castle peak 14115 ft *b*, Pyramid peak 13885 ft *c*, Maroon Mountain 14003 ft — CARBONIFEROUS SANDSTONES

d, Maroon Creek *e*, Bellevue peak 12350 ft *f*, Treasury Mountain 13200 ft *g*, Snowmass Creek

h, Snowmass Mtn. 13970 ft. *i*, Capitol pk. 13997 ft *j*, Mt Daly 13193 ft *k*, Sopris pk. 12823 ft — ERUPTIVE GRANITE

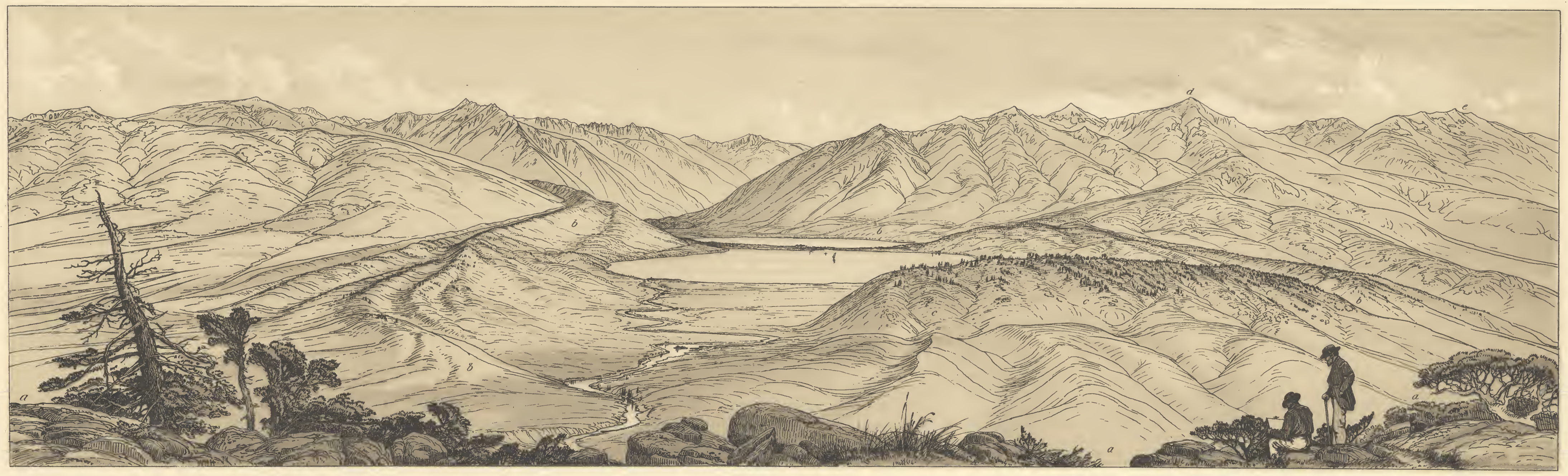
s, s, Silurian Quarzites

CENTRAL PORTION OF THE ELK MOUNTAINS
LOOKING WEST.

U.S. GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, F.V. HAYDEN IN CHARGE

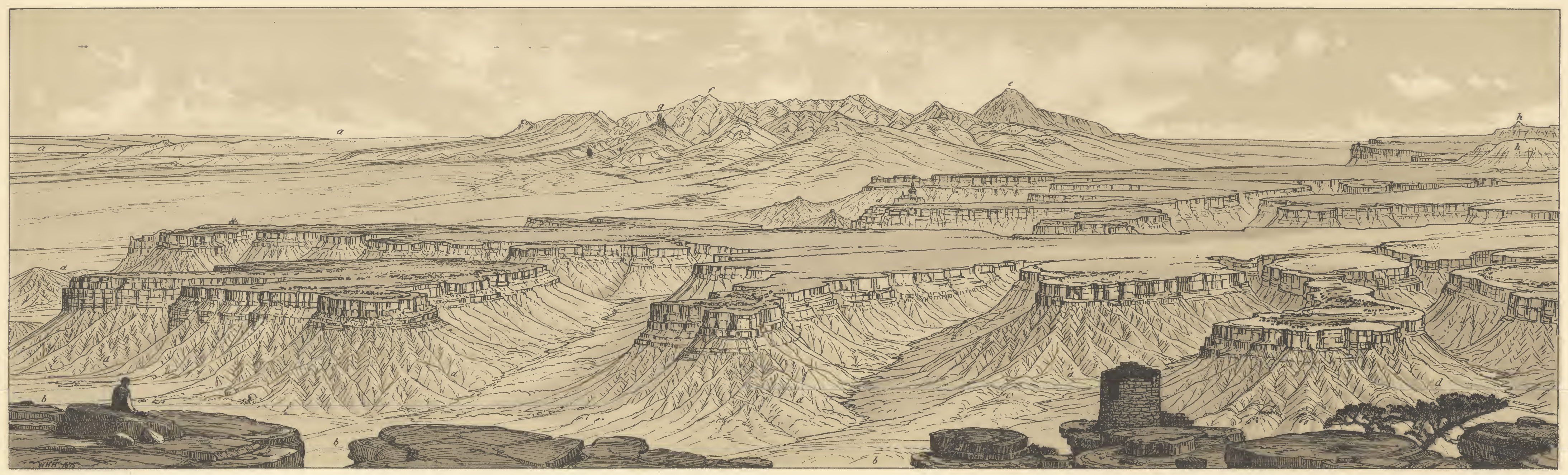
PANORAMIC VIEWS.

SHEET XX



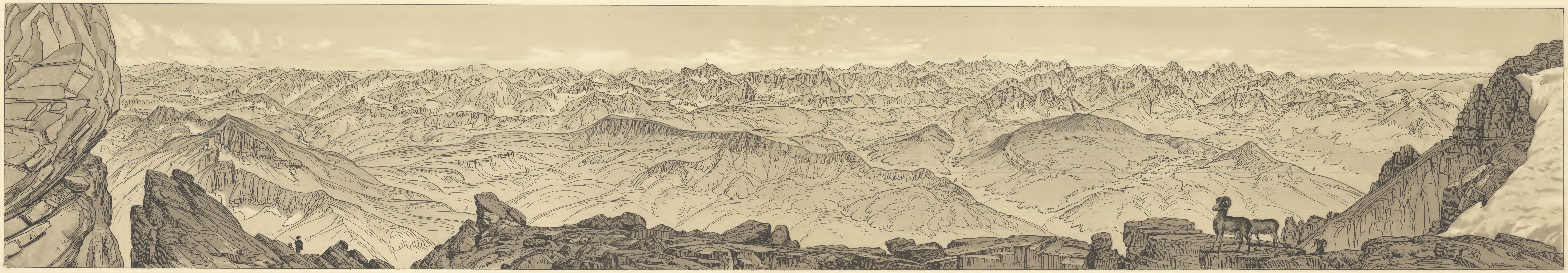
a, a, a, Valley of the Arkansas *b, b,* Lateral Moraines *c, c, c,* Terminal Moraine *d,* Mt. Elbert 14351 ft. elevation *e, e,* Massive Mt. 14298 ft. elevation

THE TWIN LAKES - LAKE FORK OF THE ARKANSAS
SHOWING THE GREAT MORAINES



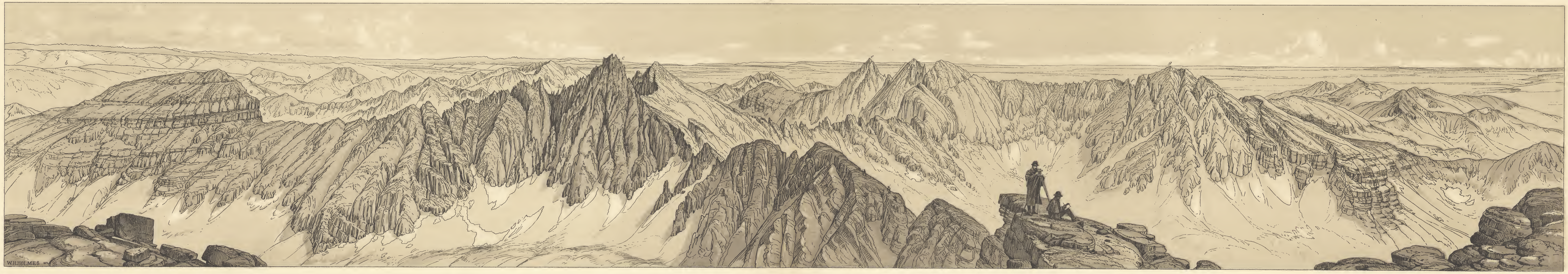
a, a, Valley of the Rio San Juan *b, b,* Lower part of Mancos Cañon *c, c,* Upper Cretaceous Sandstones *d, d,* Middle Cretaceous Shales *e,* Ute Mountain 9984 ft. elevation *f,* Hermano peaks 9014 ft. elevation *g,* Sentinel Rock *h,* Remnants of Coal Measures

SOUTH WESTERN BORDER OF THE MESA VERDE SHOWING THE SIERRA EL LATE
IN THE DISTANCE
LOOKING WEST ACROSS THE CAÑON OF THE RIO MANCOS



a, a, a, a, Head waters of the Rio Los Pinos *b, b, b,* Head waters of the Rio Grande Del Norte *c,* Mt. Oso 13640 ft. elevation *d,* Mt. Aeolus 14054 ft. elevation *e,* Approximate location of Cunningham pass, which leads from the Rio Grande over the divide to the San Juan Mines.

THE QUARTZITE GROUP - SAN JUAN MOUNTAINS
LOOKING SOUTH WEST FROM THE RIO GRANDE PYRAMID



San Juan Mts. in the Distance *a, a,* Cretaceous Shales alternate with sheets of Trachyte *b, b,* Valley of the Animas *c,* Mt. Moss 13135 ft. elevation *d, d,* Head waters of the Rio La Plata Drainage of the foreground belongs to the Rio Mancos *e,* La Plata peak 13000 ft. elevation *f,* Sentinel Rock *g,* Spiller's Peak *h, h,* Metamorphosed Cretaceous Strata Basin of the Rio San Juan in the Distance

THE LA PLATA MOUNTAINS
VIEW LOOKING EAST FROM MT. HESPERUS SHOWING THE TRACHYTE MASS AND ITS RELATIONS TO THE SURROUNDING SEDIMENTARY FORMATIONS

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3 1197 21827 1200